Bowditch (H.P.)

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RELATION BETWEEN GROWTH AND DISEASE.

BY

H. P. BOWDITCH, M.D.,
MASSACHUSETTS.

EXTRACTED FROM THE
TRANSACTIONS OF THE AMERICAN MEDICAL ASSOCIATION, 1881.

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In acceding to the request of the Secretary to prepare a paper to be read before the Section on Children's Diseases, it seems to me that I can in no way better employ the time allotted to me than in calling attention to the importance of securing statistics in regard to the physique of growing children. The determination of the correct average rate of growth of the human race at different ages, in both sexes and under various social, ethnical, and geographical conditions, has both a theoretical and practical interest, and a brief enumeration of a few of the problems upon which light would be thrown, were the subject thoroughly investigated in different parts of the country, may, therefore, be permitted in this connection.

Military statistics, and particularly those derived from the researches of Dr. Gould[1] and Dr. Baxter[2] during the late civil war, have shown that the size of adult native Americans is very different in different States of the Union, and even in different parts of the same State. It has even been maintained that natives of the Eastern States, emigrating in childhood to the West, attain to a stature resembling that of the natives of the States to which they emigrate. These observations seem to indicate a direct influence of climate upon the development of the race, and it remains to be shown, by measurements of growing children, at what age this influence begins to be manifested. In other words, the question to be solved is, whether the inhabitants of certain Western States are taller than those of New England because they grow faster, or because their period of growth

[1] Investigations in the Military and Anthropological Statistics of American Soldiers, by Benjamin Apthorp Gould. New York, 1869.

[2] Statistics, Medical and Anthropological, of the Provost-Marshal-General's Bureau, by J. H. Baxter, A.M., M.D. Washington, 1875.

is more prolonged. This study of the influence of climate upon development could be advantageously prosecuted in those Western communities which consist almost exclusively of emigrants (and their descendants) from some limited region in Europe.

The question whether the season of the year exerts an influence upon the rate of growth is interesting, in view of the many analogies which vegetable and animal life afford. The observation reported by Pagliani[1] that, in the case of girls living in the country, the first menstruation occurs much more frequently in the spring than at other seasons, seems to indicate that the nutritive processes of the human body are really influenced by the seasons, and that, therefore, the rate of growth may be expected to depend to some extent upon the varying conditions thus afforded. The problem demands for its solution a very large number of careful monthly or quarterly measurements of the height and weight of healthy growing children.

The determination of the comparative effect of city and country residence, of poverty and riches, of occupation and mode of life upon the rate of growth, presents problems towards the solution of which certain progress has already been made, but a great deal of work still remains to be done, and a systematic collection of observations throughout the country cannot fail to secure valuable scientific results.

Statistics in regard to the size of growing children have been thus far collected chiefly in schools and colleges, where large numbers of children can be readily subjected to measurement. The rate of growth during the school age, *i. e.*, from five to twenty years, has thus been approximately determined. Lying-in hospitals and infant asylums have furnished similar data for early infancy, but between this period and the beginning of school life there is an interval of about four years, during which very few observations on growing children have been recorded. Owing to the fact that children of this age are seldom to be found collected in institutions, it is evident that the necessary data must be obtained by collating isolated observations taken in families where children of suitable age are to be found. In securing and collecting observations of this sort, members of the medical profession have it in their power to render important aid in this branch of scientific research. To secure uniformity

[1] Lo Sviluppo Umano, p. 59.

and to facilitate the collection of anthropometrical statistics, the Massachusetts State Board of Health, Lunacy, and Charity is prepared to distribute blank cards and circulars of instruction to all who are willing to aid in this investigation, and it is probable that the National Board of Health will soon undertake a similar work on a large scale.

It is not, however, for the purpose of securing the aid of the medical profession in the solution of a purely scientific problem that I have ventured to bring this subject before the Section on Children's Diseases of the American Medical Association. It is because *it seems probable that the accurate determination of the normal rate of growth in children will not only throw light upon the nature of the diseases to which childhood is subject, but will also guide us in the application of therapeutic measures*, that I urge the subject upon the consideration of the profession. There is a large class of diseases well recognized as particularly affecting growing children, and it is very important to ascertain how far the peculiar liability of childhood to these disturbances is due to the rapid growth characteristic of early life, and how far it is dependent upon other conditions accidentally associated with the period of growth. The statistics of growth, taken in connection with those of disease, might very possibly reveal unexpected relations between periods of slow and rapid growth and the ages at which certain diseases most frequently occur.

A still more direct connection between rate of growth and disease would doubtless be manifested were it possible to obtain statistics, showing the growth of children before and after various acute diseases. It has been frequently remarked, for instance, that a period of rapid growth is apt to follow certain fevers, and it would, therefore, be very interesting to inquire whether this accelerated growth *after* the disease is anything more than a compensation for a retardation *during* the disease, and whether in this period of rapid growth the height and weight preserve their normal relation to each other.

By studying the changes of weight of the human body we obtain, moreover, an indication of the activity of the nutritive processes there occurring. This is particularly true in the case of growing children, in whom nutrition is so active that it not only balances the natural waste of the organism (as in adults), but also provides extra material for increasing the size of the body. It is not unnatural, therefore, that one of the earliest

symptoms of disturbed nutrition should be a loss of weight or a diminution in the natural rate of growth. That this is really the case to an extent scarcely appreciated by the profession, many observations seem to show. In the New York *Medical Journal* for February, 1881, Dr. Evetzky has given tables and curves showing the weekly growth of children during the first year, as ascertained by observations in the New York Infant Asylum. As the result of this investigation it would appear that the disturbances of nutrition incident to dentition are indicated by a decided diminution in the normal rate of growth. Unfortunately the observations of Dr. Evetzky are not numerous enough to place the results beyond all doubt, but the research is one which challenges further investigations in the same direction.

Dr. Percy Boulton has also contributed to our knowledge of this subject in an article published in the *Lancet* for Oct. 16, 1880. In this paper the author draws his conclusions from successive observations taken on the same children for a period of ten years, but as he does not state the number of children thus measured, it is impossible to judge of the value of the results arrived at. From the figures which he gives, it would appear that English children, up to twelve years of age, are heavier in proportion to their height than American children, while after that age the reverse is the case. Of the relation between growth and disease Dr. Boulton writes as follows:—

"Arrest of growth, or loss of weight, precedes so many diseases, that it may be looked upon as a danger signal, and if the 'caution' is noticed before the disease point is reached, catastrophe may frequently be prevented, and so childhood may be worked on a kind of 'block system.' It is thus that it becomes of such value in preventive medicine.

"In pulmonary consumption loss of weight generally precedes cough, and, according to Dr. Dobell's Table No. 4, hæmoptysis only occurred eight times out of one hundred cases before loss of weight had been noticed. Moreover, while cough is a symptom at once recognized and noticed, loss of weight is so insidious that it is apt to go some time unnoticed. The number of cases in which loss of weight began before cough is sure to be understated."

How far in advance of the onset of each disease the "danger signal" of arrest of growth is shown can be determined only by frequent and systematic observations on growing children. In

all probability the "caution" will be more useful in the case of chronic than in that of acute diseases, though even in the latter class of diseases it is not impossible that the warning may be given in time to be of use.

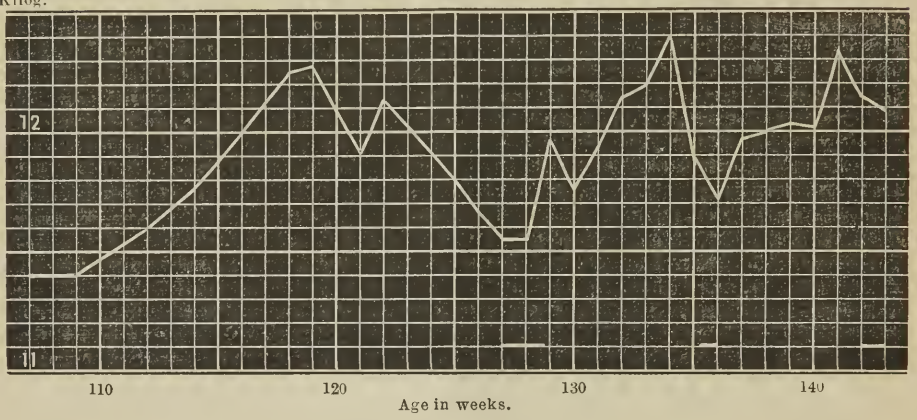
As an example of the kind of observation which it is desirable to secure, the following table is presented, showing the rate of growth of a girl between two and three years old and the relation between growth and disease. The figures represent the absolute weight of the child, obtained by weighing in the ordinary manner, and then deducting the weight of the clothes.

Date.	Age. Weeks.	Weight.		
		Kilo.	Lbs.	
1880.				
Sept. 19	107	11.40	25.08	
Oct. 3	109	11.40	25.08	
Nov. 7	114	11.78	25.91	
Dec. 5	118	12.25	26.95	
" 12	119	12.28	27.01	
" 26	121	11.90	26.18	
1881.				
Jan. 2	122	12.15	26.73	
" 23	125	11.80	25.96	
" 30	126	11.65	25.63	
Feb. 6	127	11.55	25.41	Enlarged cervical glands noticed Feb. 5.
" 13	128	11.55	25.41	Clay-colored dejections Feb. 12–15.
" 20	129	11.95	26.29	
" 27	130	11.75	25.85	
March 6	131	11.94	26.26	
" 13	132	12.15	26.73	
" 20	133	12.20	26.84	
" 27	134	12.41	27.30	
April 3	135	11.91	26.20	Attack of measles beginning April 5.
" 10	136	11.71	25.76	
" 17	137	11.98	26.35	
" 24	138	12.00	26.40	
May 1	139	12.03	26.47	
" 8	140	12.01	26.42	
" 15	141	12.34	27.14	
" 22	142	12.15	26.73	Cold in the head beginning about May 22.
" 29	143	12.09	26.60	

An examination of this table, or of the curve constructed from it, and given in Fig. 1, shows that the child, having grown rapidly during the autumn, suddenly, and without any manifest cause, began to lose weight about the middle of December. This loss of weight was irregularly progressive until Feb. 6th, when an enlargement of the cervical lymphatic glands was noticed,

followed, a week later, by clay-colored dejections. These symptoms yielded to appropriate treatment, and the child again gained weight rapidly till March 27th, when a sudden loss of

Fig. 1.



Showing variations of weight in a growing child. The short horizontal lines indicate periods of sickness.

weight occurred, followed by an attack of measles, to which disease the child had been exposed. A subsequent loss of weight in May seems to have been associated with rather a severe cold in the head.

We have here, then, a case in which a disorder of nutrition manifested itself by enlarged glands and by clay-colored discharges, but in which these symptoms were preceded for several weeks by a progressive loss of weight. It seems not unreasonable to suppose that this loss of weight was the first symptom of a disturbance which afterwards manifested itself by more unequivocal signs. Even in the case of the acute attack of measles, it will be noticed that loss of weight preceded by at least a week the actual eruption of the disease.

It must not be supposed that loss of weight in a growing child is, in every instance, a precursor of actual disease. The weight of a healthy child is liable to oscillations, within limits which have yet to be determined. It is only by systematic observations on an extensive scale that the real importance of this branch of preventive medicine can be ascertained. Enough is already known to warrant a careful study of the subject, and it is with the hope of encouraging further investigations that the matter is brought before this Section of the American Medical Association.

The weekly weighing of a family of children is not so laborious as it might, at first sight, appear. It is, of course, important that the weighings should always take place at the same hour of the day, in order to make the influence of the meals the same in the successive observations. The evening, just before bedtime, is convenient for this purpose, as the weight of the clothes in which the children are weighed can then be readily determined. Small platform scales, suitable for the purpose, are useful and inexpensive articles of household furniture, and when the work of weekly weighing is once systematically undertaken the actual time required is found to be very short, while the record thus obtained cannot fail to furnish important information in regard to the child's constitution, and to afford valuable indications for the guidance of the family physician.